

them may sometimes make their Observations together, and that from divers Experiments we may be the better assured of what certainty and exactness such kind of Observations are like to prove. And because many of the Stars which may happen to come within the compass of such an *Iconism*, or Map, may be such as are only visible through a good *Telescope*, whose Positions perhaps have not been noted, nor their longitudes, or latitudes, any where remarked; therefore each Observer should endeavour to insert some fixt Star, whose longitude, and latitude, is known; or with his *Telescope* he shall find the Position of some notable *telescopic* Star, inserted in his Map, to some known fixt Star, whose place in the *Zodiack* is well defin'd.

Having by this means found the true distance of the Moon, and having observed well the *apparent Diameter* of it at that time with a good *Telescope*, it is easie enough, by one single Observation of the *apparent Diameter* of the Moon with a good Glass, to determine her distances in any other part of her *Orbit*, or *Dragon*, and consequently, some few Observations will tell us, whether she be mov'd in an *Ellipsis*, (which, by the way, may also be found, even now, though I think we are yet ignorant of her true distance) and next (which without such Observations, I think, we shall not be sure of) we may know exactly the bigness of that *Ellipsis*, or Circle, and her true velocity in each part, and thereby be much the better enabled to find out the true cause of all her Motions. And though, even now also, we may, by such Observations in one station, as here at *London*, observe the *apparent Diameter* and motion of the Moon in her *Dragon*, and consequently be enabled to make a better guess at the *Species* or kind of Curve, in which she is mov'd, that is, whether it be spherical, or *elliptical*, or neither, and with what proportional velocities she is carried in that Curve; yet till her true *Parallax* be known, we cannot determine either.

Next, for the true distance of the Sun, the best way will be, by accurate Observations, made in both these forementioned stations, of some convenient Eclipse of the Sun, many of which may so happen, as to be seen by both; for the *Penumbra* of the Moon may, if she be sixty Semi-diameters distant from the Earth, and the Sun above seven thousand, extend to about seventy degrees on the Earth, and consequently be seen by Observers as far distant as *London*, and *St. Helena*, which are not full sixty nine degrees distant. And this would much more accurately, then any way that has been yet used, determine the *Parallax*, and distance, of the Sun; for as for the Horizontal *Parallax* I have already shewn it sufficiently uncertain; nor is the way of finding it by the Eclipse of the Moon any other then hypothetical; and that by the difference of the true and *apparent* quadrature of the Moon is less not uncertain, witness their Deductions from it, who have made use of it; for *Vendeline* puts that difference to be but 4'. 30". whence he deduces a vast distance of the Sun, as I have before shewn. *Ricciolo* makes it full 30'. 00. but *Reinoldus*, and *Kircher*, no less then three degrees. And no wonder, for if we examine the *Theory*, we shall find it so complicated with uncertainties.

First,

First, From the irregular surface of the Moon, and from several *Parallaxes*, that unless the *Dichotomy* happen in the *Nonagesimus* of the *Ecliptick*, and that in the Meridian, &c. all which happen so very seldom, that it is almost impossible to make them otherwise then uncertainly. Besides, we are not yet certain, but that there may be somewhat about the Moon *analogous* to the Air about the Earth, which may cause a refraction of the light of the Sun, and consequently make a great difference in the *apparent dichotomy* of the Moon. Their way indeed is very rational and ingenious; and such as is much to be prefer'd before the way by the Horizontal *Parallax*, could all the uncertainties be remov'd, and were the true distance of the Moon known.

But because we find by the Experiments of *Vendeline*, *Reinoldus*, &c. that Observations of this kind are very uncertain also: It were to be wisht, that such kind of Observations, made at two very distant stations, were promoted. And it is so much the more desirable, because, from what I have now shewn of the nature of the Air, it is evident, that the refraction may be very much greater then all the Astronomers hitherto have imagined it: And consequently, that the distance of the Moon, and other Planets, may be much less then what they have hitherto made it.

For first, this Inflection, I have here propounded, will allow the shadow of the Earth to be much shorter then it can be made by the other *Hypothesis* of refraction, and consequently, the Moon will not suffer an Eclipse, unless it comes very much nearer the Earth then the Astronomers hitherto have supposed it.

Secondly, There will not in this *Hypothesis* be any other shadow of the Earth, such as *Kepler* supposes, and calls the *Penumbra*, which is the shadow of the refracting *Atmosphere*; for the bending of the Rays being altogether caus'd by *Inflection*, as I have already shewn, all that part which is ascribed by *Kepler*, and others after him, to the *Penumbra*, or dark part, which is without the *umbra terræ*, does clear vanish; for in this *Hypothesis* there is no refracting surface of the Air, and consequently there can be no shadows, such as appear in the ninth Figure of the 37. *Scheme*, where let ABCD represent the Earth, and EFGH the *Atmosphere*, which according to *Kepler's* supposition, is like a Sphere of Water terminated with an exact surface EFGH, let the lines MF, LB, ID, KH, represent the Rays of the Sun; 'tis manifest, that all the Rayes between LB, and ID, will be reflected by the surface of the Earth BAD, and consequently, the conical space BOD would be dark and obscure; but, say the followers of *Kepler*, the Rays between MF, and LB, and between ID, and KH, falling on the *Atmosphere*, are refracted, both at their ingress and egress out of the *Atmosphere*, nearer towards the Axis of the spherical shadow CO, and consequently, inlighten a great part of that former dark Cone, and shorten, and contract, its top to N. And because of this Reflection of these Rays, say they, there is superinduc'd another shell of a dark Cone FPH, whose Apex P is yet further distant from the Earth: By this *Penumbra*, say they, the Moon

is